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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/681,609	05/08/2001	Gregory T. Stauf	Atmi-497	8601

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ATMI, INC.
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EXAMINER
LE, THAO X

ART UNIT	PAPER NUMBER
2814	

DATE MAILED: 07/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/681,609	STAUF ET AL.	
	Examiner	Art Unit	
	Thao X Le	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-39* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-26 and 28-39* is/are rejected.

7)☒ Claim(s) 27 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 May 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *100702*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. In view of the Appeal Brief filed on 20 Jan 2004, PROSECUTION IS HEREBY REOPENED. New grounds of rejection are set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) request reinstatement of the appeal.

If reinstatement of the appeal is requested, such request must be accompanied by a supplemental appeal brief, but no new amendments, affidavits (37 CFR 1.130, 1.131 or 1.132) or other evidence are permitted. See 37 CFR 1.193(b)(2).

2. The rejection of this Office Action is based on the amended claims entered on 06 May 2003.

Drawings

3. The drawings are objected to because in fig. 4 the number 76 should read 70. Corrected drawing sheets are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where

necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 1-39 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The limitation 'wherein said material of said at least one metal layer is Al, said at least one material of said conductive barrier layer is not Ir or IrO_2' in claim 1 line 13-14 had been carefully review and found that they were not in the original disclosure. The original specification consistently discloses the electrodes 18/20, 36/38, 52/54, and 70/78 can be either

aluminum or copper. There is no exclusion of Al when the conductive barrier is Ir or IrO_2. Thus, for the purpose of examination, such limitations are not being considered.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1, 2, 4 are rejected under 35 U.S.C. 102(b) as being anticipated by US 5985731 to Weng et al.

Regarding to claim 1, Weng discloses a microelectronic structure in fig. 12 comprising: at least one layer of high dielectric constant material 28 (40), column 2 line 59, at least one conductive barrier layer 26 (38), column 2 line 40, in contact with the layer of high dielectric constant material 28 (40), wherein such conductive barrier layers 26 (38) comprises at least one material selected from the group consisting of TaN (Weng discloses layer 38 comprises Ta, Ti, W, Cu, Al, and nitrides thereof, i.e. TiN, TaN, WN, CuN, AlN, column 2 lines 43-45), at least one metal layer 22 (24), column 2 line 28, in contact with the conductive barrier layer 26 (38), wherein the metal layer 22 (24) comprises metal, column 2 line 30, wherein at least one conductive barrier layer 26 (38) is between at least one layer of high dielectric constant material 28 (40) and at least one metal layer 22(24).

Regarding claims 2, 4 Weng discloses a microelectronic structure wherein conductive barrier layer 26 (38) comprises at least one material selected from the group consisting of TaN, column 2 line 44, wherein the metal layer 22 (24) comprises Cu, column 2 line 30.

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

9. Claims 1-9, 11-12, 14, 16-18, 20-21, 28-39 are rejected under 35 U.S.C. 102(e) as being anticipated by US 6320213 to Kirlin et al.

The applied reference has a common Assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

Regarding to claim 1, Kirlin discloses a microelectronic structure in fig. 13 comprising: at least one layer of high dielectric constant material 112, column 5 line 57, at least one conductive barrier layer 116/120, column 6 lines 29 and 40, in contact with the layer of high dielectric constant material 112, wherein such conductive barrier layers comprises at least one material selected from the group consisting of Pt, column 6 line 30, at least one metal layer 130, column 7 line 17, in contact with the conductive barrier layer 116/120, wherein the metal layer

130 comprises metal, column 7 line 16, wherein at least one conductive barrier layer 116/120 is between at least one layer of high dielectric constant material 112 and at least one metal layer 130

Regarding claims 2-3, Kirlin discloses a microelectronic structure wherein conductive barrier layer 115/120 comprises at least one material selected from the group consisting of TiAlN, column 6 line 40.

Regarding claims 4-5, Kirlin discloses a microelectronic structure wherein metal layer 130 comprises Cu or Al, column 7 line 16.

Regarding to claims 6-8, Kirlin discloses the layer of high dielectric constant material comprises BST, column 5 line 57.

Regarding claim 9, Kirlin discloses the conductive barrier layer 120 has a thickness approximately 100nm, column 6 line 42.

Regarding to claims 11-12, 14, 16-17, Kirlin discloses a microelectronic structure wherein the conductive barrier 22 comprises Pt, column 6 line 30, Ir, column 6 line 59, Ru, column 6 line 58, TiAlN, column 6 line 40, TaN, column 6 line 54.

Regarding to claim 18, Kirlin discloses a microelectronic structure comprising a first conductive barrier layer 116 and a second conductive barrier layer 120, wherein the first conductive barrier layer 116 is in contact with the layer of high dielectric constant material 112, and the second conductive barrier layer 120 overlies first conductive layer 116 and is in contact with the metal layer 130.

Regarding claims 20-21, Kirlin discloses a microelectronic structure the first conductive barrier layer 116 comprises Pt, and second conductive barrier layer 120 comprises TiAlN, or Ir, column 6 line 59.

Regarding claims 28-31, Kirlin discloses a microelectronic structure comprising at least one layer of BST or PZT material 112, a first conductive barrier layer 116 is in contact with layer 112 and comprising Pt, a second conductive barrier 120 layer overlaying first conductive layer 116 and comprising Ir, column 6 line 59, at least one metal layer 130 in contact with second conductive barrier layer 120 comprising Cu.

Regarding claim 32-39, Kirlin discloses the device comprising a capacitor, memory cell, non-volatile memory cell, DRAM, see background.

10. Claims 1-3, 6-19, 20-26, and 32-39 are rejected under 35 U.S.C. 102(e) as being anticipated by US 6462931 to Tang et al.

Regarding to claims 1, Tang discloses a microelectronic structure in fig. 8i comprising: at least one layer of high dielectric constant material 215, column 8 line 33, at least one conductive barrier layer 212/213/214, column 8 line 23, in contact with the layer of high dielectric constant material 215, wherein such conductive barrier layers comprises at least one material selected from the group consisting of Ir, column 8 line 23, at least one metal layer 211 in contact with the conductive barrier layer 212/213/214, wherein the metal layer 211 comprises metal, column 8 line 9, wherein at least one conductive barrier layer 212/213/214 is between at least one layer of high dielectric constant material 215 and at least one metal layer 211.

Regarding claims 2-3, Tang discloses a microelectronic structure wherein conductive barrier layer 212/213/214 comprises at least one material selected from the group consisting of TiAlN, column 9 line 27.

Regarding to claims 6-8, Tang discloses the layer of high dielectric constant material comprises BST, column 8 line 33.

Regarding claims 9-10, Tang discloses the conductive barrier layer has a thickness approximately 100 nm or 5-20 nm, column 8 line 21.

Regarding to claims 11-17, 20-25, Tang discloses a microelectronic structure wherein the conductive barrier comprises Pt, Ir, IrO_2, Ru, RuO_2, column 2 lines 7 and 32, TiAlN or TaN, column 9 line 27.

Regarding to claim 18, Tang discloses a microelectronic structure comprising a first conductive barrier layer 214 and a second conductive barrier layer 212, wherein the first conductive barrier layer 214 is in contact with the layer of high dielectric constant material 215, and the second conductive barrier layer 214 overlies first conductive layer 212 and is in contact with the metal layer 211.

Regarding claim 19, Tang discloses the a microelectronic structure wherein the first conductive barrier layer comprises Pt, column 2 line 7, and second conductive barrier comprises IrO_2, column 8 line 23.

Regarding claim 26, Tang discloses the microelectronic structure comprising a first conductive barrier 214, a second conductive barrier layer 213, a third conductive barrier layer 212, wherein first conductive barrier 214 is in contact with the high dielectric constant layer 215, wherein second conductive barrier layer 213 overlies first conductive barrier layer 214, and

wherein third conductive barrier layer 212 overlies the second conductive barrier 213 and is in contact with the metal layer 211, fig. 8i.

Regarding claim 32-39, Tang discloses the device comprising a capacitor, memory cell, non-volatile memory cell, DRAM, and others, see background.

11. Claims 1-3, 6-9, 11-18, 23, 25 are rejected under 35 U.S.C. 102(e) as being anticipated by US 6171898 to Crenshaw et al.

Regarding to claim 1, Crenshaw discloses a microelectronic structure in fig. 1 comprising: at least one layer of high dielectric constant material 40, column 3 line 33, at least one conductive barrier layer 34/36, in contact with the layer of high dielectric constant material 40, wherein such conductive barrier layers comprises at least one material selected from the group consisting of Pt, column 3 line 20, at least one metal layer 32, column 4 line 24, in contact with the conductive barrier layer 34/36, wherein the conductive layer 32 comprises doped polysilicon, wherein at least one conductive barrier layer 34/36 is between at least one layer of high dielectric constant material 40 and at least one conductive layer 32.

Regarding claims 2-3, Crenshaw discloses a microelectronic structure wherein conductive barrier layer 34/36 comprises at least one material selected from the group consisting of TiAlN, column 3 line 11.

Regarding to claims 6-8, Crenshaw discloses the layer of high dielectric constant material comprises BST, column 3 line 35.

Regarding claim 9, Crenshaw discloses the conductive barrier layer has a thickness approximately 100nm, column 4 line 39.

Regarding to claims 11-17, Crenshaw discloses a microelectronic structure wherein the conductive barrier 36 comprises Pt, column 3 line 20, Ir, Ru, IrO_2, column 3 lines 22-24, TiAlN, column 3 line 11, TaN, column 3 line 14.

Regarding to claims 18, Crenshaw discloses a microelectronic structure comprising a first conductive barrier layer 36 and a second conductive barrier layer 34, wherein the first conductive barrier layer 34 is in contact with the layer of high dielectric constant material 40, and the second conductive barrier layer 34 overlies first conductive layer 36 and is in contact with the metal layer 32.

Regarding claims 23, 25 Crenshaw discloses a microelectronic structure the first conductive barrier layer 36 comprises Ir or IrO_2 second conductive barrier layer 34 comprises TiAlN, column 3 lines 10 and 22.

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

13. Claims 6-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5985731 to Weng et al.

Regarding claims 6-10, Weng does not disclose the conductive barrier layer has a thickness in a range of from about 1-100nm or 5nm to about 20nm.

However, Weng discloses the conductive barrier layer 26 (38) has a thickness in a range of from 50-200 nm, column 2 line53. Accordingly, it would have been obvious to one of ordinary skill in art to use conductive barrier teaching of Weng in the range as claimed, because it has been held that where the general conditions of the claims are discloses in the prior art, it is not inventive to discover the optimum or workable range by routine experimentation. See In re Aller, 220 F.2d 454, 105 USPQ 233, 235 (CCPA 1955).

14. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over US 6320213 to Kirlin et al.

Regarding claim 10, Kirlin does not disclose the conductive barrier layer has a thickness in a range of from about 5nm to about 20nm.

However, Kirlin discloses the conductive barrier layer 120 has a thickness approximately 100nm, column 6 line 42. Accordingly, it would have been obvious to one of ordinary skill in art to use conductive barrier teaching of Kirlin in the range as claimed, because it has been held that where the general conditions of the claims are discloses in the prior art, it is not inventive to discover the optimum or workable range by routine experimentation. See In re Aller, 220 F.2d 454, 105 USPQ 233, 235 (CCPA 1955).

15. Claims 4-5 are rejected under 35 U.S.C. 103(e) as being unpatentable over US 6462931 to Tang et al in view of US 6593638 to Summerfelt et al.

Regarding to claims 4-5, Tang does not disclose a microelectronic structure wherein the metal layer 211 comprises Cu or Al.

But, Summerfelt discloses the layer 211 comprises metal, column 8 line 9. And Summerfelt reference discloses the conductive metal layer 46 or 50 can be W, Cu, Al or polysilicon, Table column 6. At the time of the invention was made; it would have been obvious to one of ordinary skill in the art to use the Al or Cu metal layer teaching of Summerfelt to replace the metal layer 211 of Tang, because such substitution would have been considered a mere substitution of art-recognized equivalent material.

Allowable Subject Matter

16. Claim 27 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The prior art of record does not disclose all the limitations of the claim 27 including a first conductive barrier comprises IrO_2, a second conductive layer comprises Ir_2O_3, and a third conducive barrier layer comprises Ir.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thao X Le whose telephone number is (571) 272-1708. The examiner can normally be reached on M-F from 8:00 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M Fahmy can be reached on (571) 272 -1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Thao X. Le
06 July 2004

LONG PHAM
PRIMARY EXAMINER